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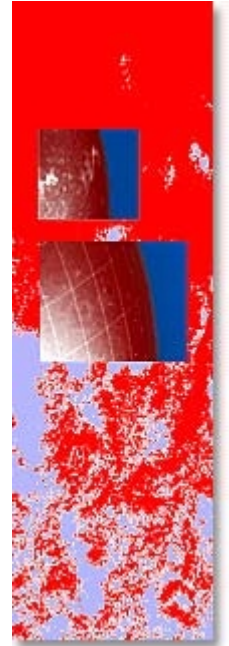
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Development, characterization, and performance of the EOS MODIS sensors

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ABSTRACT

The MODerate-resolution Imaging Spectroradiometer (MODIS) is the keystone instrument for the NASA's Earth Observing System (EOS). Currently two nearly identical MODIS instruments are operating on-board the EOS Terra spacecraft (launched in December 1999) and the EOS Aqua spacecraft (launched in May 2002), providing global coverage of the Earth's land, oceans, and atmosphere with both morning and afternoon observations. This paper reviews the EOS MODIS development history, its design concepts, system implementation and calibration, current status and the follow-on Visible/Infrared Imaging Radiometer Suite (VIIRS) under development for the National Polar Orbiting Environmental Satellite System (NPOESS).

Keywords: MODIS, EOS, history, development, VIIRS

1. INTRODUCTION

In the early 1980s the scientific community began to realize that there were a number of major science problems that would require treating the Earth as a single interacting system. The principal areas of concern were weather, climate and the ecosystem. Scientists and technologists both internal and external to the National Aeronautics and Space Administration (NASA) began conceptual studies of a system of satellites with numerous diverse sensors capable of furnishing the long-term, well-calibrated data sets necessary to address these problems. After over twenty years of planning and development, the Earth Observing System (EOS) is coming to fruition. A key player within the EOS is the MODerate-resolution Imaging Spectroradiometer (MODIS), a global imaging system with 36 spectral bands and nadir spatial resolutions of 250 meters (2 bands), 500 meters (5 bands) and 1000 meters (29 bands). During the last four years, MODIS sensors were launched onboard both the EOS/Terra satellite (December, 1999) and the EOS/Aqua satellite (May, 2002). Both are performing at or better than their overall design specifications and have generated more than a peta-byte of data for use by the world's science and applications communities.

This paper will examine, in broad terms, the conceptual development, implementation, characterization and calibration of the MODIS system and will conclude with a short overview of present status and future realizations.

2. HISTORY

In the spring of 1983, NASA formed the Earth Observing System (EOS) Science and Mission Requirements Working Group (EOSMRWG) to outline the requirements for observing the Earth as a system from low Earth orbit. The report from this group¹ discussed the need for several sensors including a MODerate-resolution Imaging Spectrometer (MODIS), a multi-spectral imaging radiometer capable of frequent global surveys at a spatial resolution of 1 kilometer. In early 1984, NASA created six instrument panels to study requirements for the sensors called out in the EOSMRWG report. One of these was the MODIS Instrument Panel consisting of 18 scientists and engineers under the direction of Dr. Wayne Esaias from NASA Headquarters (Table I).

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